# MISSOURI MONTHLY VITAL STATISTICS

## *Provisional Statistics*

*FROM THE*

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# *Focus. . . Effects of Changing From the 1940 to the Year 2000 Standard Population for Age-Adjusted Death Rates in Missouri*

Age-adjustment provides a means of comparing death rates for populations with different age distributions. Since 1943 the National Center for Health Statistics has used the 1940 United States population as the standard population for these comparisons. Beginning with 1999 death data, they will use the projected year 2000 United States population distribution. Missouri will also implement this change with 1999 data.

Reasons for the change are that the 1940 population sounds too old and outdated and that multiple standards are being used by federal agencies (1940, 1970 and 1980) and a single standard should be used for better comparisons and to avoid confusion. In addition the 1940 standard creates rates that are much different from the current crude rates.

The purpose of this paper is to evaluate the effects of this change in standard populations on general trends in total mortality and causes of death, on death rates by race and by gender, and on relationships between Missouri and United States death rates. Death data from the 1990s are used for these comparisons.

Table 1 shows the age distribution of the two standard populations. The year 2000 population has about double the percent 65 or more and five times the proportion 85 or more as the 1940 population. The median age is about 6.5 years older for the 2000 population. By comparison, the Missouri and US 1995 populations are of course closer to the 2000 standard, with the Missouri population slightly older than the nation. The crude Missouri death rate in 1995 was 19 percent higher than the US rate (10.2 vs. 8.6). After adjustment for age, the Missouri rate was 6 percent higher than the nation using the 1940 standard and 4 percent higher using the 2000 standard. The 2000 rates are nearly double the 1940 standard rate because of its older distribution.

Table 2 shows the effect that the change in standard populations has on the magnitude of the rates by leading cause. All of the rates increase with the 2000 standard, but some causes increase much more than others. Causes related to aging such as heart disease, stroke, pneumonia and influenza, nephritis and septicemia all more than double with the new standard. Causes

**Table 1**
**Population Distributions and Death Rates of Selected Populations**

| *Population Distribution* | *US 1940* | *US 2000* | *MO 1995* | *US 1995* |
|---|---|---|---|---|
| Percent 65+ | 6.8% | 12.6% | 13.9% | 12.8% |
| Percent 85+ | 0.3% | 1.6% | 1.7% | 1.4% |
| Median Age | 29.2 | 35.7 | 34.9 | 34.3 |
| *Death Rates per 1,000* | | | | |
| Crude | | | 10.2 | 8.6 |
| Age-adj-1940 Std | | | 5.3 | 5.0 |
| Age-adj-2000 Std | | | 9.6 | 9.2 |

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that occur frequently throughout the life span such as accidents or suicide show only a slight increase with the new standard. The rankings of the leading causes by age-adjusted death rate also change slightly with the new standard. For example accidents are number 3 using 1940 and number 5 using the 2000 standard. Cancer was nearly catching heart disease using the 1940 standard, but is one-third lower than heart disease mortality using 2000.

Differentials by race and gender will be reduced with the new standard as shown in Table 3. According to 1995 Missouri death rates, the differential between black and white death rates was 57 percent using the 1940 standard compared with just 35 percent using the 2000 standard. This is because black/white mortality differentials are greater for younger ages that are weighted more with the younger 1940 standard population. Similarly the male to female mortality differential was reduced from 72 percent with the 1940 standard to 56 percent with the 2000 standard. The ratio of black male mortality to white female mortality was reduced from 2.8 with the 1940 standard to less than 2.2 with the 2000 standard.

Table 4 presents the black/white mortality ratio changes by cause. For heart disease and stroke, which primarily affect the elderly, the black to white differentials are cut in half using the 2000 standard compared with the 1940 standard. The heart disease differential was reduced from 44 percent to 22 percent and the stroke differential was reduced from 66 percent to 33 percent with the 2000 standard. For such causes as cancer , accidents and AIDS there is little change in the black/white mortality ratios.

We also examined percent changes from 1990 to 1995 in age-adjusted death rates by cause for Missouri and the United States using the two standard populations. The changes within geographic area were usually in the same direction, although there were some differences. For example there recently was a great deal of publicity about declining cancer death rates in the 1990s. In Missouri this was true using the 1940 standard population (-0.6 percent), but not true using the 2000 standard (+1.1 percent). In the United States, the cancer mortality decrease was cut in half using the 2000 standard ( 3.8 vs. 2.0 percent decrease).

**Table 2**
**Age-Adjusted Death Rates per 100,000 Population by Cause: Missouri 1995**

| | *1995* | | *Ratio* |
|---|---|---|---|
| | *1940 Std* | *2000 Std* | *2000: 1940* |
| Heart Disease | 151.8 | 323.4 | 2.13 |
| Cancer | 138.6 | 221.2 | 1.60 |
| Stroke | 29.2 | 69.1 | 2.37 |
| Accident | 35.0 | 40.6 | 1.16 |
| Pneumonia & Influenza | 14.9 | 39.0 | 2.62 |
| Chronic Obstructive Pulmonary Disease | 23.2 | 43.2 | 1.86 |
| Diabetes | 12.7 | 22.0 | 1.73 |
| Suicide | 12.8 | 13.6 | 1.06 |
| Nephritis | 4.7 | 10.8 | 2.30 |
| Septicemia | 4.3 | 8.9 | 2.07 |
| All Causes | 530.4 | 964.9 | 1.82 |

**Table 3**
**Age-Adjusted Death Rates per 1,000 Population by Race and Sex: Missouri 1995**

| | *1995* | | *Ratio to White Females-1995* | |
|---|---|---|---|---|
| | *1940 Std* | *2000 Std* | *1940 Std* | *2000 Std* |
| White Males | 6.5 | 11.8 | 1.71 | 1.55 |
| White Females | 3.8 | 7.6 | 1.00 | 1.00 |
| Black Males | 10.7 | 16.5 | 2.80 | 2.17 |
| Black Females | 5.8 | 10.0 | 1.52 | 1.32 |
| Whites | 5.0 | 9.4 | Ratio to Whites-1995 | |
| Blacks | 7.9 | 12.6 | 1.57 | 1.35 |
| | | | Ratio to Females-1995 | |
| Males | 6.9 | 12.2 | 1.72 | 1.56 |
| Females | 4.0 | 7.8 | | |

(***Focus*** continued)

Table 5 examines trends in Missouri and US total death rates during the 1990s. Rates are down using both standards, but show a smaller decrease using the 2000 standard than the 1940 standard. The ratio of the Missouri rate to the US rate is nearly the same (within one percent), regardless of the standard used.

We also examined the importance of using the same age groups recommended by NCHS when comparing the national death rates. The standard age groups are under 1, 1-4, 5-14, and ten year age groups up to 85+. When using 5 year age groups the death rates were generally lower than when 10 year groups were used. When the same age groups were used, nationally and locally , Missouri had a rate about 2.5 percent greater than the nation. However, when we compared the Missouri 5 year age-adjusted death rate to the national 10 year adjusted rate, the difference was just 1 percent.

In summary,

- Conversion from the 1940 to the 2000 U. S. Standard Population for age-adjustment has a major effect on the magnitude of the age-adjusted death rates, generally raising them. This is especially true for causes of death related to aging such as the various chronic diseases.

- Conversion to the 2000 Standard reduces the differentials by race and by sex. This is also is more strongly related to chronic diseases such as heart and stroke than other causes of death.

- Conversion to the 2000 Standard has minor but definite effects on trends and differentials between Missouri and the United States, apparently having more impact on trends than on differentials.

- It is important to adjust by the exact age groups used by NCHS in order to compare to national rates.

This study is not meant to imply that the 2000 standard is better or worse than the 1940 standard. It mainly is intended to demonstrate the importance of using the same standard when making comparisons. Age-adjusted death rates are useful mainly as a summary indicator of mortality. The best way to study mortality changes and differentials is examination of age-specific death rates.

**Table 4**
**Ratio of Black to White Age-Adjusted Death Rates by Cause: Missouri 1995**

| | *Black-White Ratio* | |
|---|---|---|
| | *1940 Std* | *2000 Std* |
| Heart Disease | 1.44 | 1.22 |
| Cancer | 1.39 | 1.35 |
| Accidents | 1.05 | 1.10 |
| Stroke | 1.66 | 1.33 |
| Chronic Obstructive Pulmonary Disease | 0.93 | 0.76 |
| Pneumonia & I nfluenza | 1.25 | 1.15 |
| Diabetes | 2.16 | 1.94 |
| Homicide | 12.36 | 11.55 |
| AIDS | 3.95 | 3.88 |
| Nephritis | 2.16 | 1.99 |

**Table 5**
**Trends in Total Age-Adjusted Death Rates per 1,000 Population: Missouri and United States: 1990-1998**

| | *1940 Std* | | *Percent Chng* | *2000 Std* | | *Percent Chng* |
|---|---|---|---|---|---|---|
| | *1990* | *1998* | *1990-98* | *1990* | *1998* | *1990-98* |
| Missouri | 5.23 | 5.08 | -2.9% | 9.45 | 9.41 | -0.5% |
| United States | 5.20 | 4.71 | -9.5% | 9.39 | 8.76 | -6.7% |
| MO/US Ratio | 1.006 | 1.079 | | 1.007 | 1.074 | |